Cytology

Sep 12-11:58 AM

Key Terms

Cytology - the study of the structure and function of cells

Cytoplasm - the area of space contained by the cell membrane but outside of the nucleus. The contains the organelles and the cytosol.

Organelle - tiny structures within the cytoplasm each with its own specific job.

Cytosol - the fluid portion of the cytoplasm.

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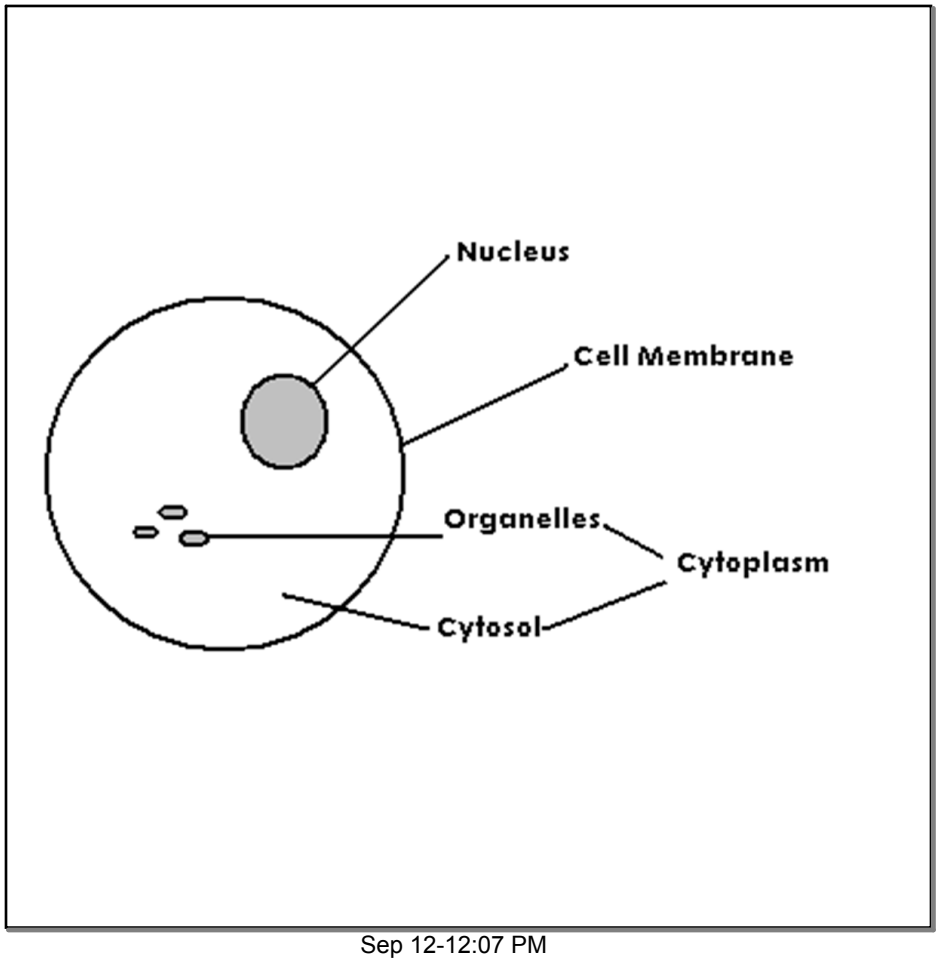
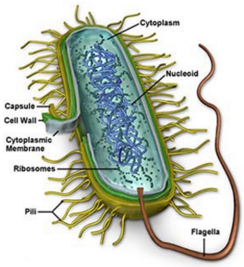
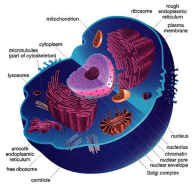


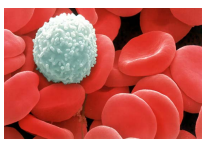
Sep 12-12:07 PM

Cell Categories

Prokaryotes	Eukaryotes
lack a nucleus	contain a nucleus
lack membrane covered organelles	contain membrane bound organelles
ex. bacteria and blue-green algae	ex. plants, animals, and fungi







Sep 12-12:11 PM

Name as Many Cell Parts as Possible

Nucleus
DNA/RNA
Mitochondria
Smooth Endoplasmic Reticulum
Rough Endoplasmic Reticulum
Ribosomes
Cytoplasm
Nuclear Membrane
Cell Membrane
Cell Wall
Golgi Apparatus
Centriole
Vacuole
Chloroplasts
Flagella/Cilia

Jun 22-9:54 AM

Cell Organelles

Organelles can be divided into five categories:

- Nucleus
- Membranous Canals and Vacuoles
- Energy - related organelles
- Cytoskeleton
- Centrioles and related organelles

Sep 23-3:40 PM

The Nucleus

Cell Type:
- Found in all cells except Prokaryotes (bacteria).

Description:
- Membrane bound
- Consists of a nucleolus, nuclear pores, nucleoplasm, and a nuclear membrane

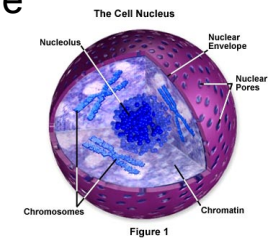


Figure 1

Function:
- Contains and protects the cell's genetic information DNA (Deoxyribonucleic acid).
- Control center of the cell.

Jun 22-9:59 AM

The Parts of the Nucleus

Nucleolus (Nucleoli) - site of ribosome formation.

Nuclear Membrane/Envelop - membrane surrounding the nucleus.

Nuclear Pores - controls what can enter or leave the nucleus.

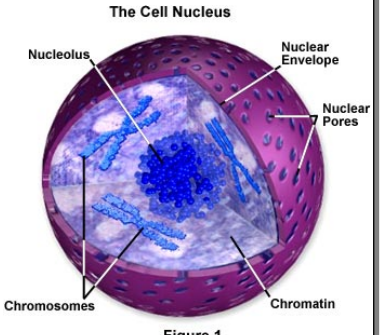


Figure 1

Sep 12-10:06 PM

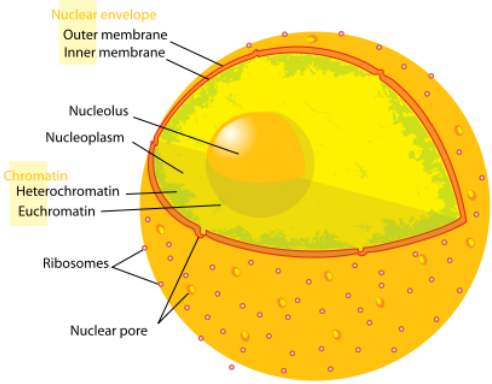
Nucleoplasm

- Surrounded by the nuclear membrane

- Similar in function to the cytoplasm of the cell.

  - highly viscous liquid that surrounds the nucleoli and chromosomes.

  - contain dissolved enzymes.



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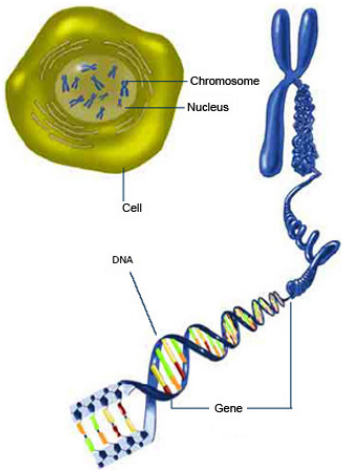
DNA

- The Human Genome consists of about 30,000 Genes.

Genes - a unit of heredity found on a stretch of DNA that codes for a particular function.



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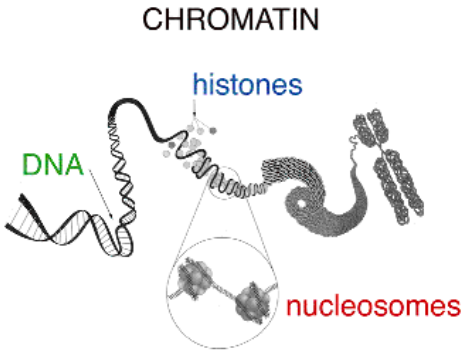
Chromatin - a complex of nucleic acids (DNA or RNA) and proteins (histones) which condense to form chromosomes during cell division.



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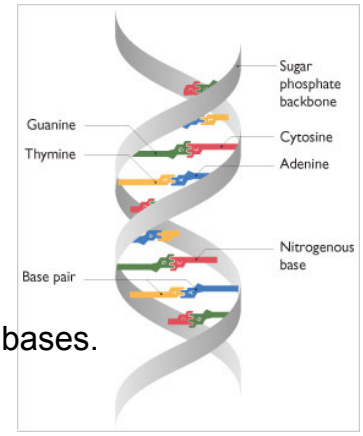
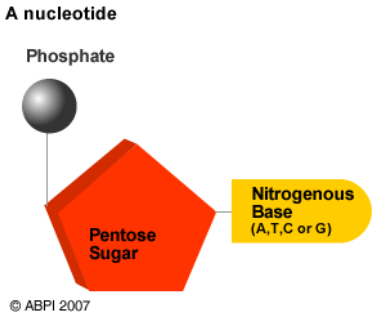
The Structure of DNA

DNA is composed of Nucleotides.



Each nucleotide is made of the following
- a phosphate group
- a pentose sugar
- a nitrogen base

There are five different types of nitrogen bases.
- Adenine - Thymine
- Cytosine - Guanine
- Uracil (seen in RNA as a replacement for Thymine)



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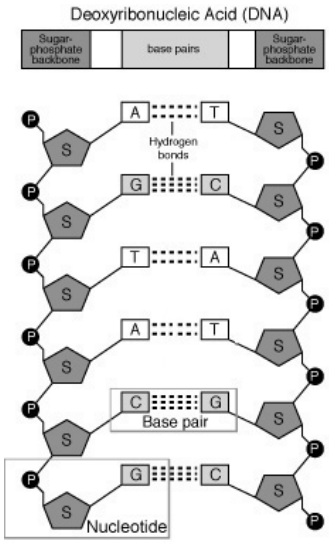
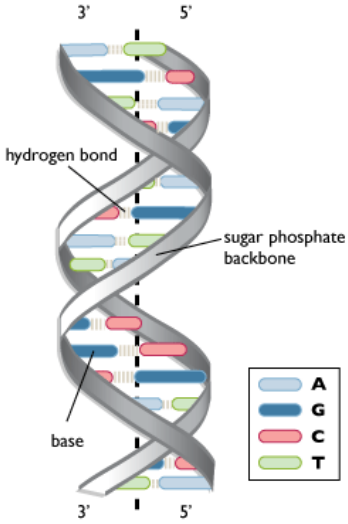
antip When two nucleotide chains connect together they form a Double Helix.





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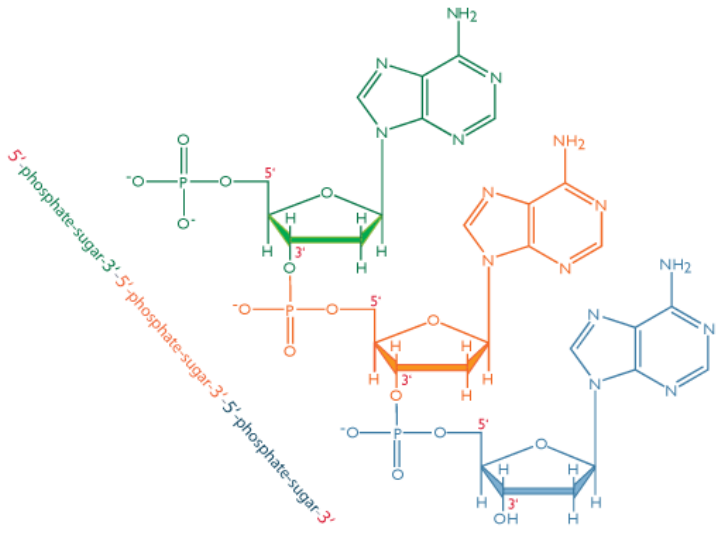
When nucleotides join together a covalent bond (phosphodiester bond) created between the 5' end of the phosphate group of one nucleotide and the 3' end of the OH group (found on the sugar) of the other nucleotide.



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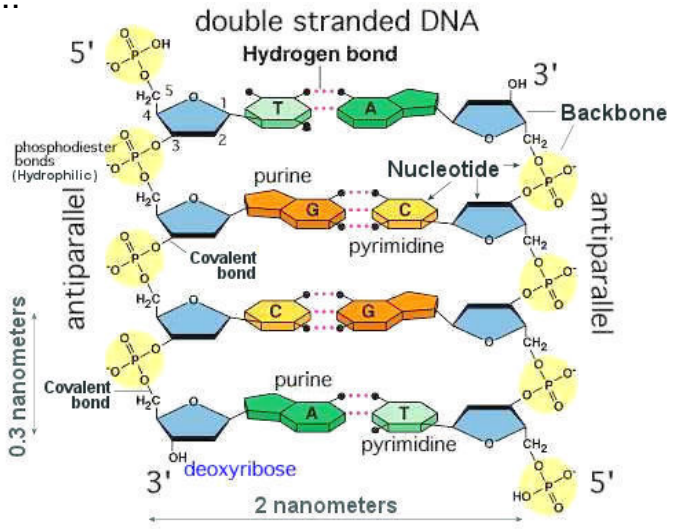
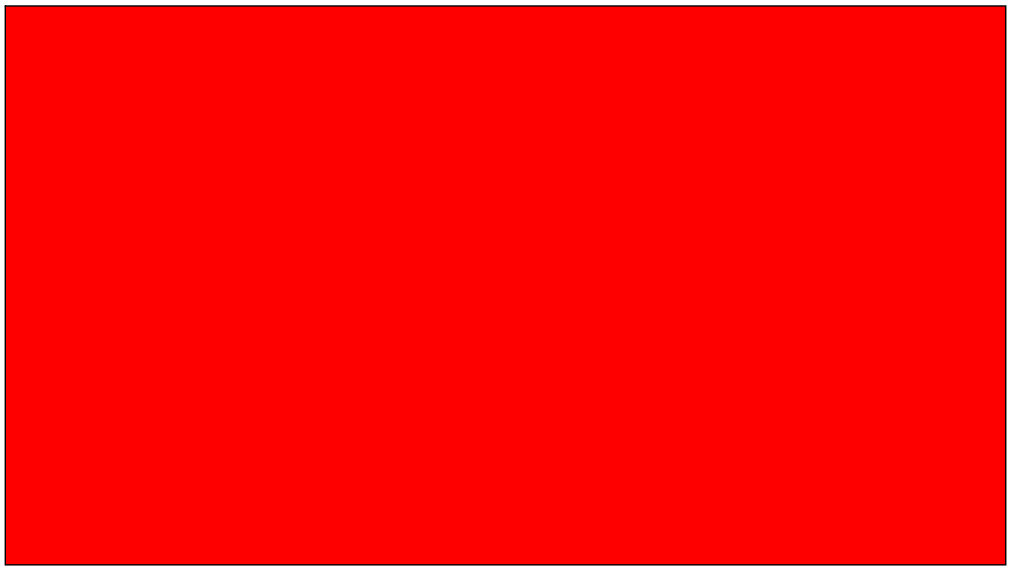
Each strand of DNA has a backbone of phosphate - sugar - phosphate - sugar ...



The strands of DNA run antiparallel. The 5' end of one strand must be able to pair with the 3' end of the other. The strands are said to be complementary. If one strand of DNA has a sequence of 5'-ATGGCT-3' the other strand must have the sequence 3'-TACCGA-5'.

Sep 16-1:54 PM

Draw a DNA strand with the base sequence A-C-T on the left side. Make the top left the 5'.



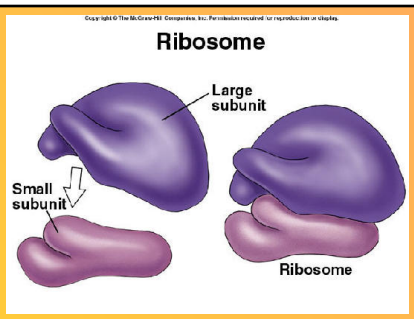
Sep 16-2:13 PM

Using your textbook, pages 175 - 179, complete the organelle handout sheet for the following organelles that belong in the category of membranous canals and vacuoles:

- Ribosome
-Endoplasmic Reticulum (Smooth and Rough)
- Golgi Apparatus
- Lysosomes
- Vacuoles

Sep 16-2:25 PM

Ribosomes



- every cell contains thousands

- assembled in the nucleus and consist of large and small subunits

- found in Cytoplasm and associated with the Rough Endoplasmic Reticulum

- Involved in protein synthesis
  - Proteins are long chains of amino acids that make up 75% of a cell's weight.

What kind of cells?

Jun 22-9:59 AM

The Role of Proteins

1) Are the main structural component of tissues.

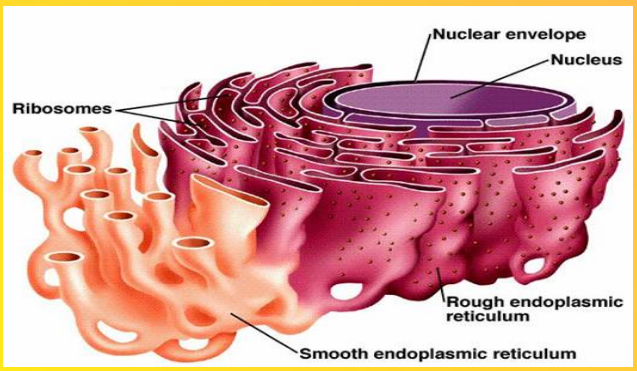
2) Act as Hormones - chemical messengers.

3) Act as Enzymes - controlling chemical reactions that occur within your cells.

Sep 23-4:00 PM

Smooth and Rough Endoplasmic Reticulum

- tubular canals continuous with the nuclear membrane.

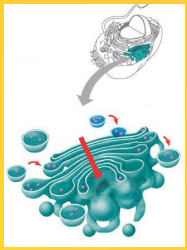


Smooth ER Function

Rough ER Function

What kind of cells?

Golgi Apparatus



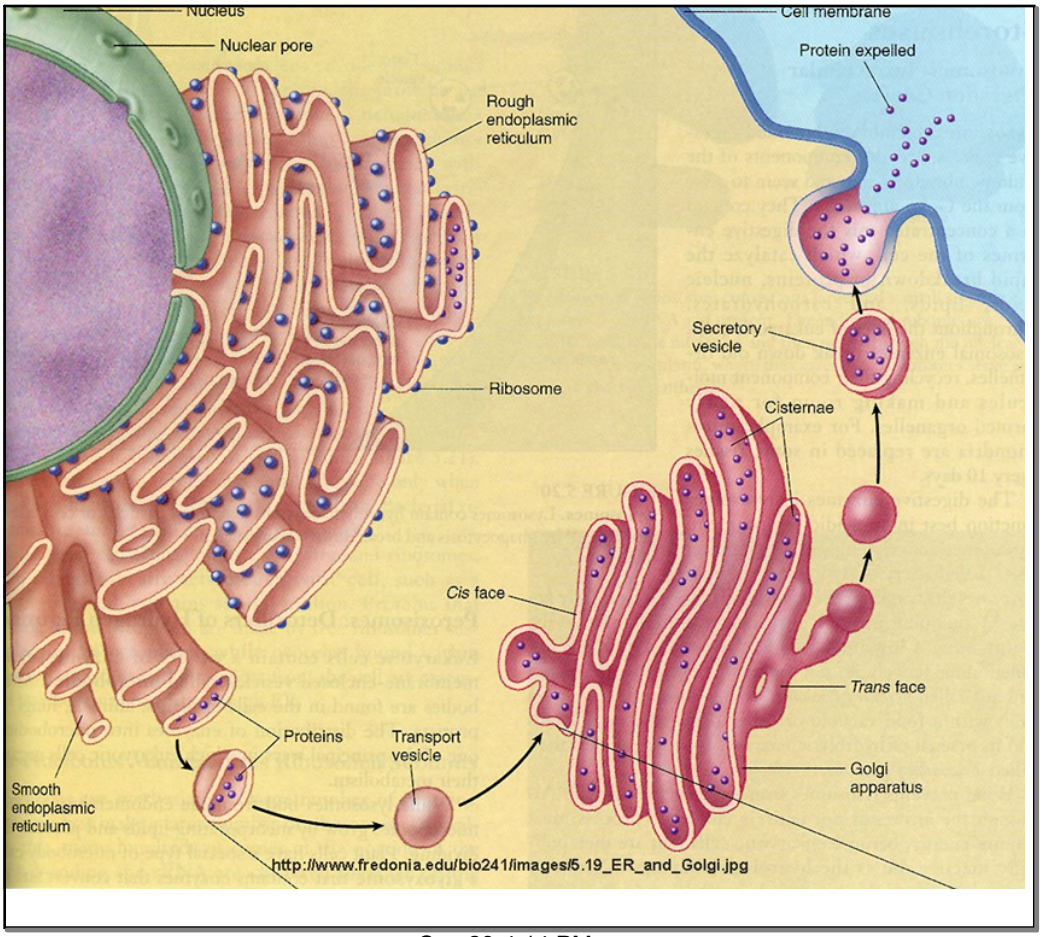
"Post Office of the Cell", it gets the proteins and lipids from the ER's and sends them to where they need to go.

Specifically the Golgi Apparatus is involved with sorting, addressing, and packaging proteins into membrane bound vesicles called Lysosomes.

- RER/Golgi Bodies

What kind of cells?

Jun 22-9:59 AM



Sep 23-4:14 PM

Lysosomes

- membranous vesicles containing digestive enzymes.

- involved in intracellular digestion and transportation.

Lysosome in action

What kind of cells?

Jun 22-9:59 AM

Vacuole

- Storage location for the cell.

- There are two general types:

  - Food Vacuoles - store food particles

  - Water Vacuoles - store water and are more prominent in plant cells

What kind of cells?

Jun 22-9:59 AM

Read 179 - 180 about the following energy-related organelles and describe there function in your notes.

Sep 23-4:37 PM

Mitochondrion

The Mitochondria (plural) is known as the Power Plant of the cell because it is involved in the break down of glucose to create energy.

What kind of cells?

Jun 22-9:59 AM

Mitochondrion have their own DNA!

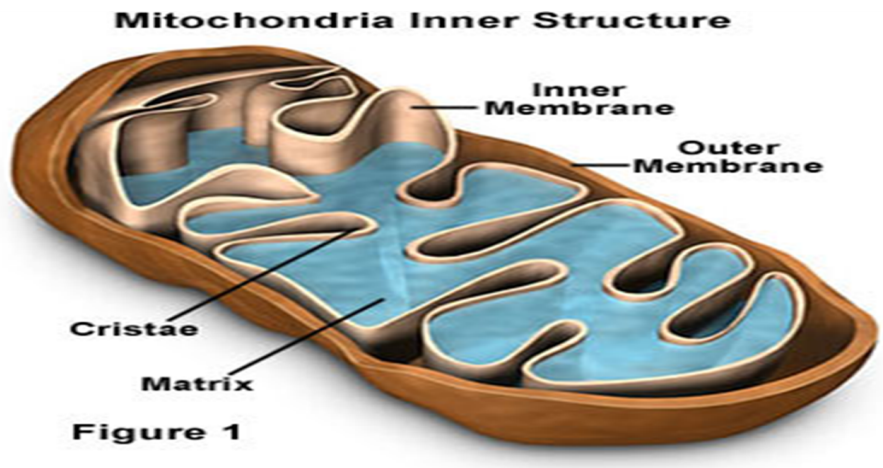
- Scientists have been using the mitochondria DNA to trace hereditary lines through history. Mitochondrion DNA is passed down from mother to child.

- Scientists believe that the first Eukaryotic cell may have been created by a mitochondria cell being engulfed by another cell.

Sep 23-4:43 PM

The Structure of the Mitochondrion

The mitochondria is bound by a double layer membrane. The outer membrane is smooth and the inner membrane is folded. These folds are called **Cristae**.



Sep 27-7:21 PM

The Mitochondrion and Cellular Respiration

The Mitochondrion creates energy through the process of Cellular Respiration. The Cristae are responsible for increasing the productivity of Cellular Respiration by increasing the amount of surface area available for the process.

Energy is created in the form of ATP (adenosine triphosphate) through the process of Cellular Respiration:

$$C_6H_{12}O_6 + 6O_2 + \text{enzyme} \Rightarrow 6CO_2 + 6H_2O + \text{Energy}$$

36 ATP molecules are created with the break down of 1 glucose molecule.

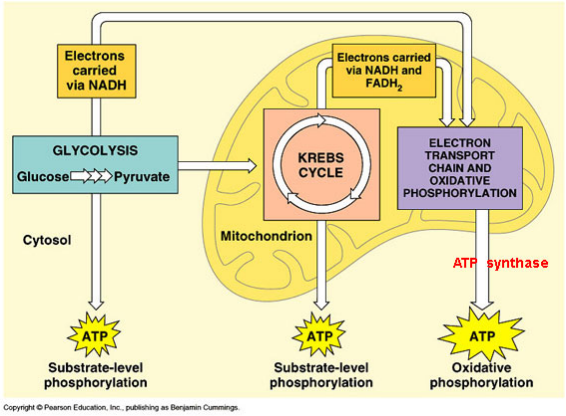
Cells such as the liver that use a large amount of energy have a high concentration of mitochondria

Sep 27-7:19 PM

Cellular Respiration

Glycolysis	2 ATP
Kreb's Cycle	2 ATP
Electron transport	32 ATP

Total = 36 ATP



Sep 23-4:54 PM

Anaerobic Respiration

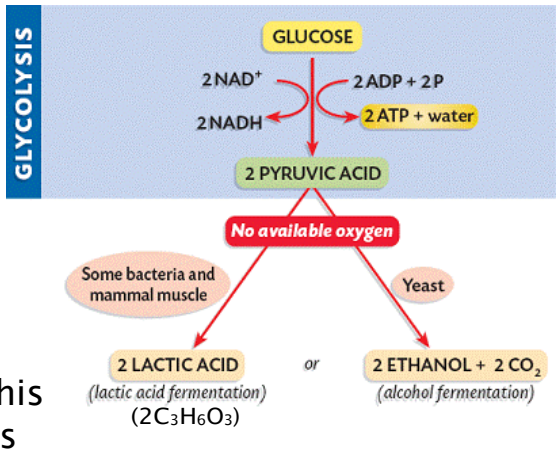
Mammals generally resort to anaerobic respiration when a quick supply of energy is required.

The process involves the break down of glucose without the use of Oxygen.

$C_6H_{12}O_6 \Rightarrow 2C_3H_6O_3 + E$

Only 2 ATP molecules are produced in this process.

One of the by products however in humans is the production of lactic acid. This is what causes your muscles to be sore after exercise.



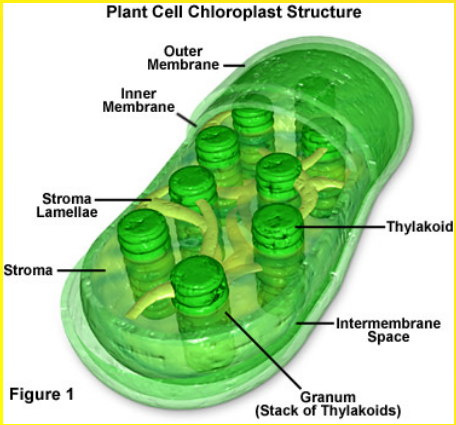
Sep 27-7:11 PM

Chloroplasts

Contain the green pigment chlorophyll.

Involved in the process of photosynthesis. Photosynthesis converts sunlight energy into chemical energy (glucose).

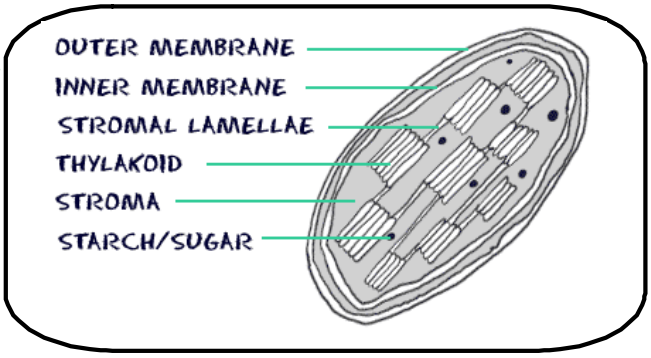
$6CO_2 + 6H_2O \xrightarrow{\text{ENERGY}} C_6H_{12}O_6 + 6O_2$

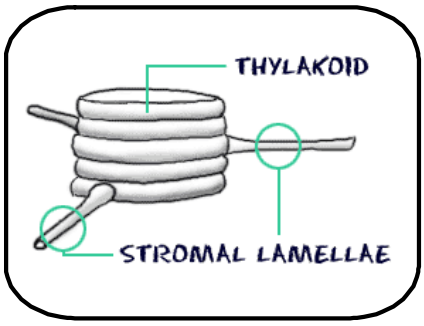


What kind of cells?

Jun 22-9:59 AM

The stroma is the area of the chloroplast in which chemical reactions occur.





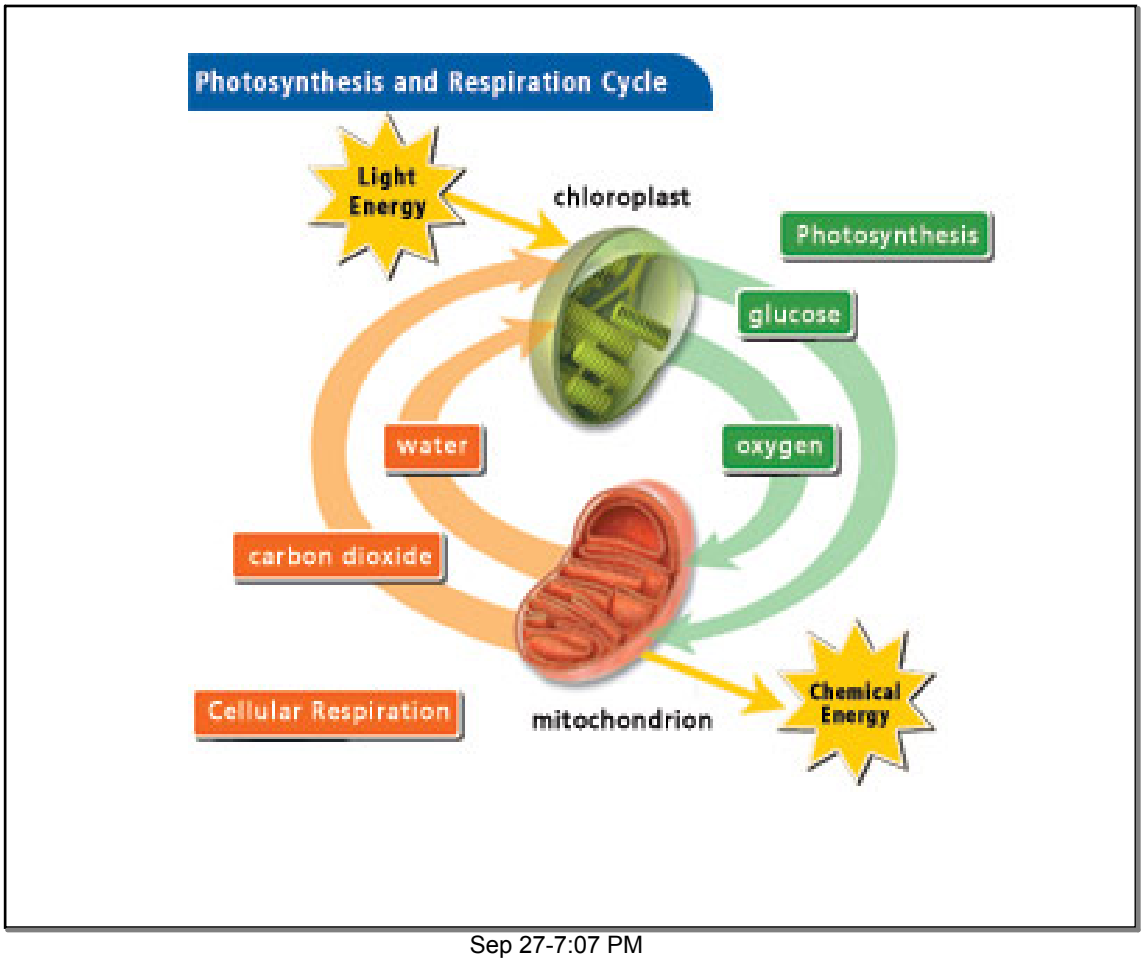
Each Thylakoid has chlorophyll on its surface. A stack of thylakoid is called a granum.

The granum are held together by the stromal lamellae

Sep 23-7:16 PM

Photosynthesis and Cellular Respiration are interdependent. Explain.

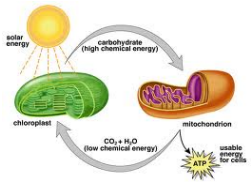
Sep 27-9:31 PM



Sep 27-7:07 PM

Comparing Photosynthesis and Cellular Respiration

	Photosynthesis	Cellular Respiration
Function		
Location		
Reactants		
Products		
Equation		



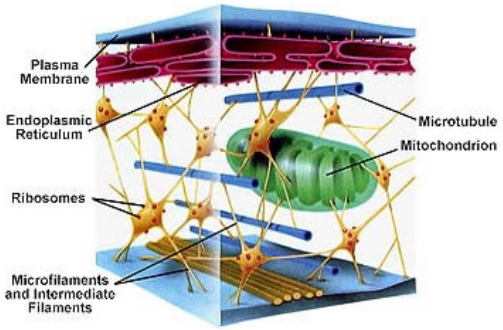
Sep 27-9:16 PM

The Cytoskeleton

The supporting structures that give eukaryotic cells their shape.

The cytoskeleton is a network of protein filaments. The primary protein filaments composing the cytoskeleton are:

- microfilaments
- microtubules



Sep 27-9:31 PM

Microfilaments:

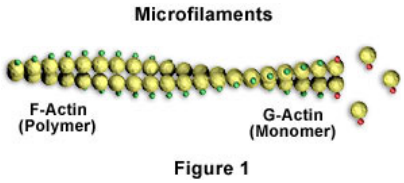


Figure 1

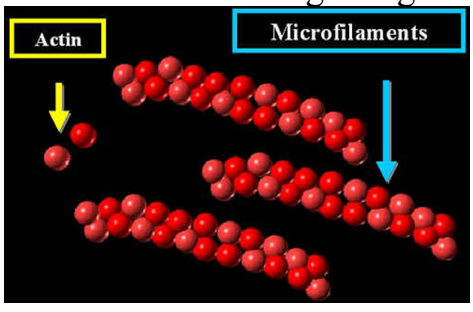
- are made from threadlike structures called actin.

- serve two functions:

1) provides a flexible framework to support the cell.

2) assemble and disassemble to allow for cytoplasmic movement.

Ex. Amoebas crawling along a surface.

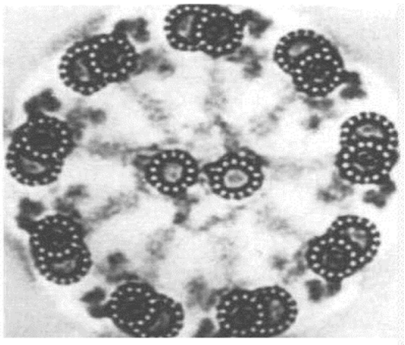


Oct 1-12:24 PM

Microtubules:

- are hollow structures made up of proteins called tubulins

- are the primary components of centrioles, cilia, and flagellum



9+2 Arrangement

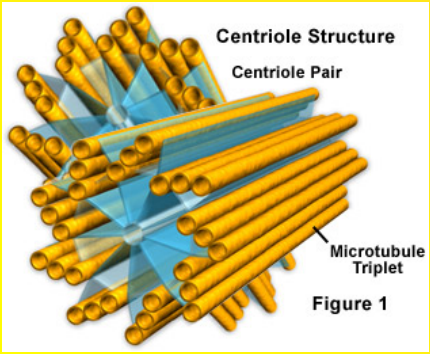
Oct 1-12:46 PM

Centriole

Occur in pairs.

Produce spindles to attach to chromosomes and pull them apart during cell division.

Have a 9 + 0 pattern of microtubule triplets (9 sets of microtubules arranged in a ring with no microtubules in the middle)



What kind of cells?

Jun 22-9:59 AM

Flagella/Cilia

Flexible projections enclosed in cell membrane and extends outward from the cell. Both the flagella and the cilia are responsible for the movement of the cell.

Cilia are short cylindrical projections that produce a wave - like motion.

Flagella are long projections that produce a whip-like motion.

http://programs.northlandcollege.edu/biology/biology1111/animations/flagellum.html

What kind of cells?

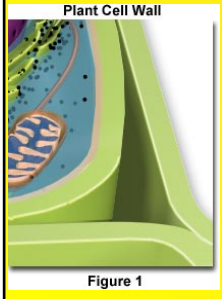
Jun 22-9:59 AM

Cell Wall

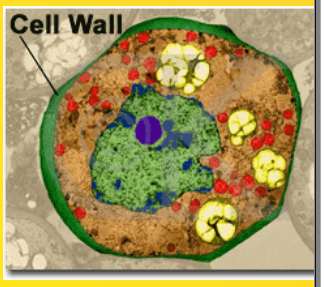
Rigid structure made of cellulose that functions to protect the cell and to help the cell maintain its shape.

- Humans have a skeleton to provide structure, organisms such as plants have a cell wall. This is why trees can grow so tall.

The cell wall surrounds the cell membrane and helps prevent the excessive uptake of water.



What kind of cells?



Jun 22-9:59 AM